EA440 AEROSPACE VEHICLE DESIGN
DESIGN SCHEDULE
Professor Rogers

General Comments:

There are no formal lectures. I will give quick short lectures on any topic of interest or in response to a question.

You should maintain a design group 3-ring notebook.

Organize the work by topic – configuration, engine selection, landing gear, weight and balance, cockpit design, interior design (if appropriate), drag build up, performance, stability and control, etc.

Include all individual work, intermediate work, false starts, etc.

Date and initial/sign all work.

Use Schaufele's or Raymer's conceptual design approach.

Use Janes *All The World's Aircraft* and Aviation Week & Space Technology for aircraft and engine comparisons.

Look at Mattingly, *Aircraft Engine Design* for mission profile, constraint analysis, mission analysis and takeo weight estimation.

Roskam's design series gives step-by-step methods and good aircraft comparisons.

Roskam gives a good discussion of drag buildup.

The USAF *Stability and Control* DATCOM is good for stability and control derivatives.

Computerize anything that is going to continuously change, e.g., the weight and balance.

Remember design is an iterative process. Do not expect to get it exactly right the first time. Learn to estimate.

Schedule:

Week 1:

Select type of aircraft to design.

Develop an individual conceptual sketch.

Week 2:

Read Schaufele Chapters 1–4.

Form design groups (1–4 individuals).

Collect data/articles on similar aircraft.

Develop a group concept sketch.

Estimate the L/D and determine the preliminary drag polar.

Estimate the power/thrust required and make a preliminary engine selection.

Estimate the specific fuel consumption and make a preliminary estimate of the range.

Week 3:

Sketch inboard profile and develop a preliminary weight and balance table including:

- wing
- fuselage
- vertical and horizontal tail
- landing gear
- engine/nacelles
- instrument panel
- Crew stations
- fuel
- cargo/seats/passengers/crew

sketch a preliminary top view.

develop a preliminary specifications table.

Week 4:

Read Schaufele Chapters 4–10

Estimate required $C_{L_{\max}}$ and required airfoil and high lift devices.

Do drag buildup and revise drag polar.

Do detailed mission profile.

Week 5:

Read Schaufele Chapters 11–16

Do a detailed inboard profile.

Do a detailed top view.

Do a preliminary instrument panel layout.

Iterate preliminary weight and balance adding more detailed information.

Iterate the specification sheet.

Week 6/7:

Read Schaufele Chapters 17–21

Continue to iterate the weight and balance table.

Determine the most forward and aft c.g. locations in percent of mac.

Determine the area of the horizontal and vertical stabilizers.

Do the final inboard profile.

Do the final top view.

Do a preliminary structural layout.

Do a preliminary landing gear layout.

Do a preliminary controls layout.

Week 8:

Configuration fixed.

Size control surfaces.

Do intermediate instrument panel layout.

Estimate stability and control derivatives.

If desired, flight test on simulator.

Week 9:

Start final drawings (on computer if desired).

Weeks 10/11:

Calculate the V-speeds.

Do detailed performance analysis, see Minimum Design Report Requirements sheet.

Finalize instrument panel layout. Begin full/half size drawing.

Weeks 12/13:

Finalize static and dynamic stability & control analysis. Does it meet the FAR's?

Week 14:

Finalize drawings and freeze design.

Weeks 15/16:

Finalize written report

Written report due NLT 21 April, 2000

21, 23, and 25 April 2000 group oral presentations during class.—

0800hrs 27 April 2000. Drop dead date for Minor corrections to the written final design report and submission of the Group Notebook.